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CLAIMS

1. A substance which can specifically interact with sugar chains.

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2. A substance according to claim 1, wherein a level of the interaction between the substance and the sugar chains is such that a necessary dissociation energy when laser irradiation is performed in a MALDI-TOF is at least 5eV.

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3. A substance according to claim 1, which is bindable to a support.

4. A substance according to claim 1, wherein the substance comprises a functional group which can react with an aldehyde group in a fluid.

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5. A substance according to claim 4, wherein the functional group is selected from a group consisting of a hydroxylamino group, a N-alkylhydroxylamino group, a hydrazide group, a thiosemicarbazide group and a cysteine residue.

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6. A substance according to claim 1, wherein the interaction comprises a covalent bond.

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7. A substance according to claim 1, wherein the interaction comprises oxime bond, hydrazone bond, thiosemihydrazone bond, perhydrothiazine ring formation or thiazolidine ring formation.

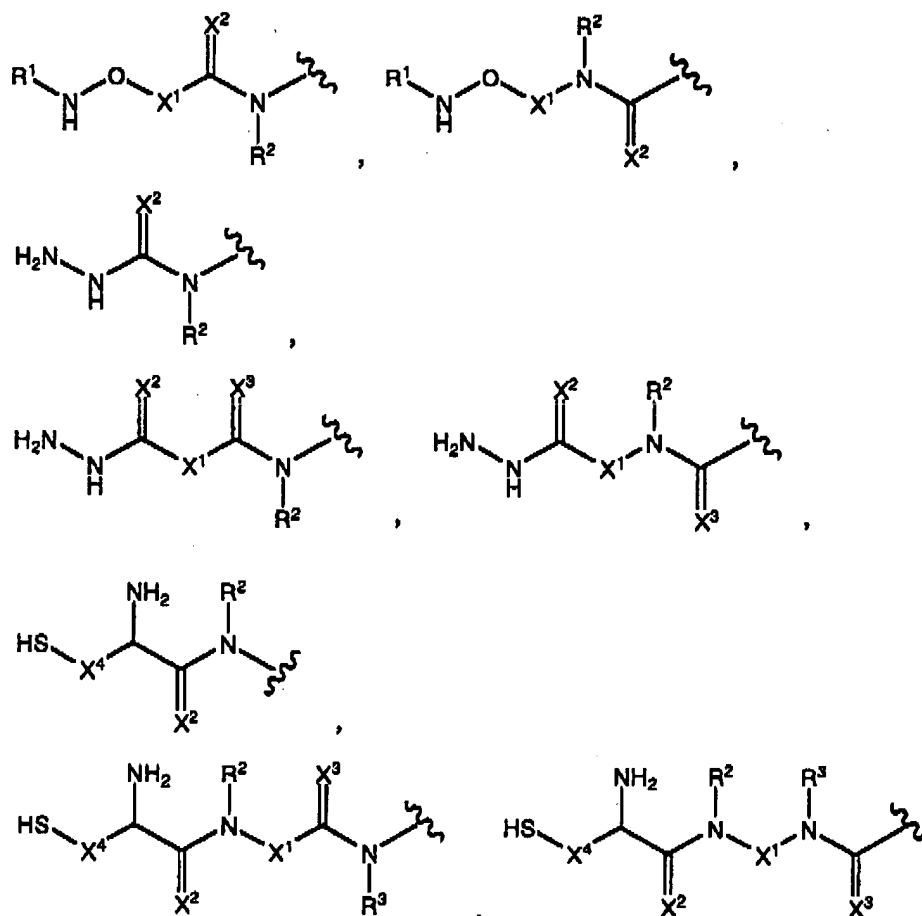
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8. A substance according to claim 1, represented by formula (I): X-Y-Z (I)

[herein, X is a group represented by formulae:

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(herein, X^1 is alkylene which may be substituted or alkenylene which may be substituted, X^2 is an oxygen atom or a sulfur atom, X^3 is an oxygen atom or a sulfur atom, X^4 is methylene or ethylene, R^1 is a hydrogen atom or alkyl, and R^2 and R^3 are independently a hydrogen atom or alkyl);

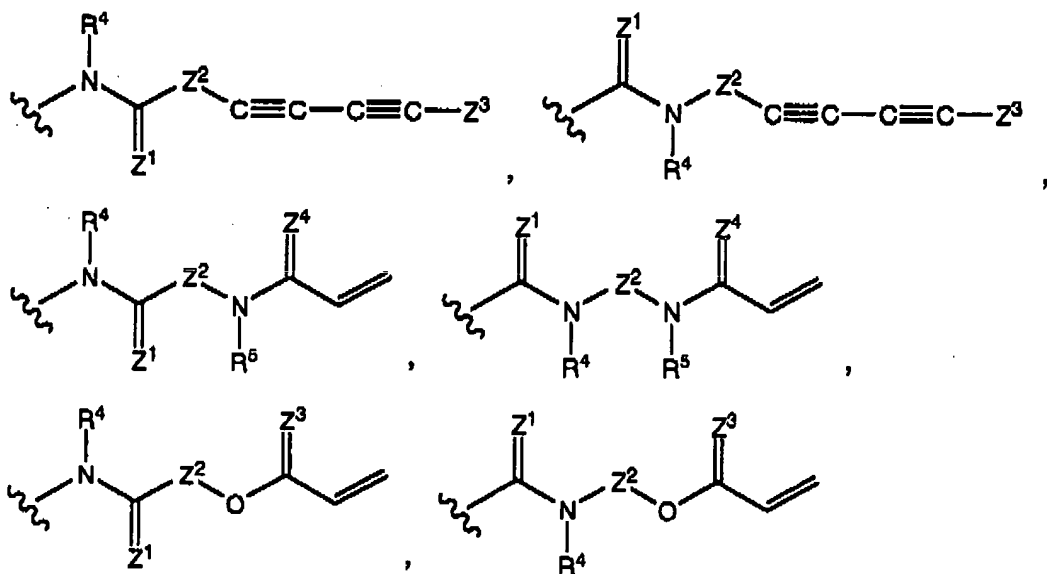
Y is single bond; optionally substituted alkylene in which at least one group selected from the group consisting -O-, -S-, -S-S-, -N(R^a)-C(=O)-, -C(=O)-N(R^b)-, and phenylene which may be substituted, may intervene; or optionally substituted alkenylene in which at least one group selected from the group consisting -O-, -S-, -S-S-, -N(R^a)-C(=O)-, -C(=O)-N(R^b)-, and phenylene which may be substituted, may

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intervene (herein, R^a and R^b are independently a hydrogen atom or alkyl);

Z is a group represented by formulae:



- 5 (herein, Z^1 is an oxygen atom or sulfur atom, Z^2 and Z^3 are independently optionally substituted alkylene in which phenylene may intervene, or optionally substituted alkenylene in which phenylene may intervene, Z^4 is an oxygen atom or a sulfur atom, R^4 and R^5 are independently a hydrogen atom or alkyl)].
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9. A substance obtained by polymerizing the substance according to claim 8.

- 15 10. A substance according to claim 9, wherein the polymerization is initiated by UV-irradiation.

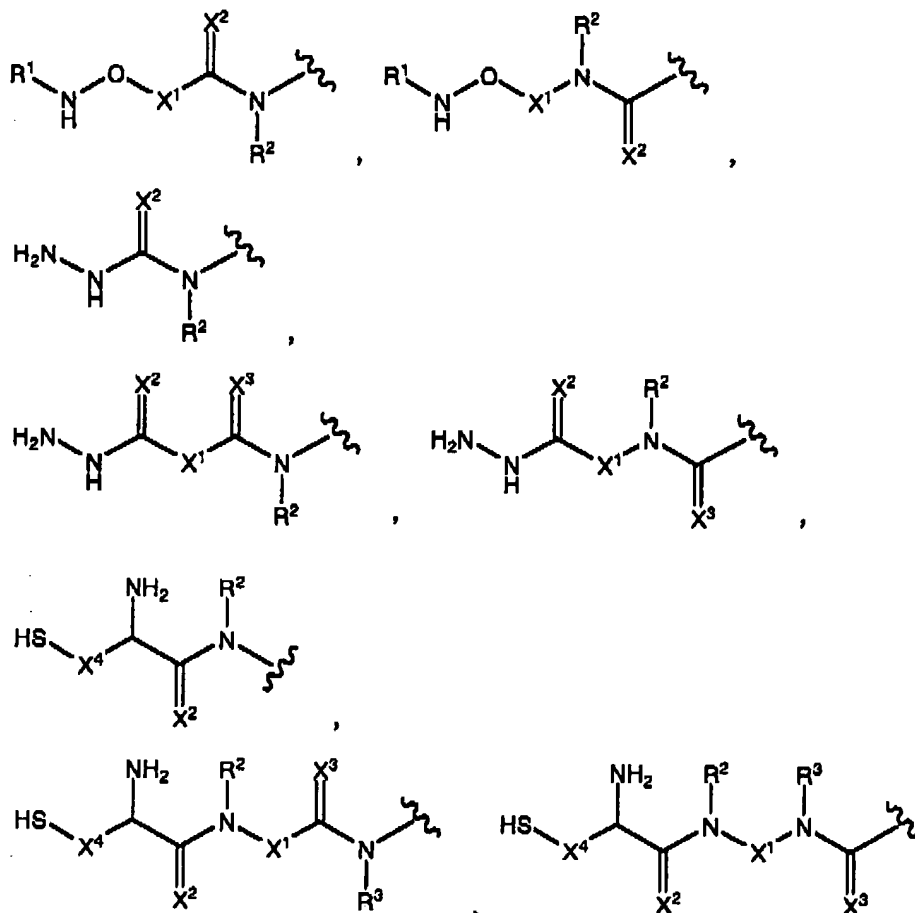
- 20 11. A substance according to claim 9, obtained by polymerizing a monolayer obtained by physical adsorption of Z site of the compound represented by formula (I) to a support.

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12. A substance according to claim 1, which is a copolymer obtained by polymerizing a compound represented by formula (I): X-Y-Z (I)

[herein, X is a group represented by formulae:



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(herein, X^1 is alkylene which may be substituted or alkenylene which may be substituted, X^2 is an oxygen atom or a sulfur atom, X^3 is an oxygen atom or a sulfur atom, X^4 is methylene or ethylene, R^1 is a hydrogen atom or alkyl, and R^2 and R^3 are independently a hydrogen atom or alkyl);

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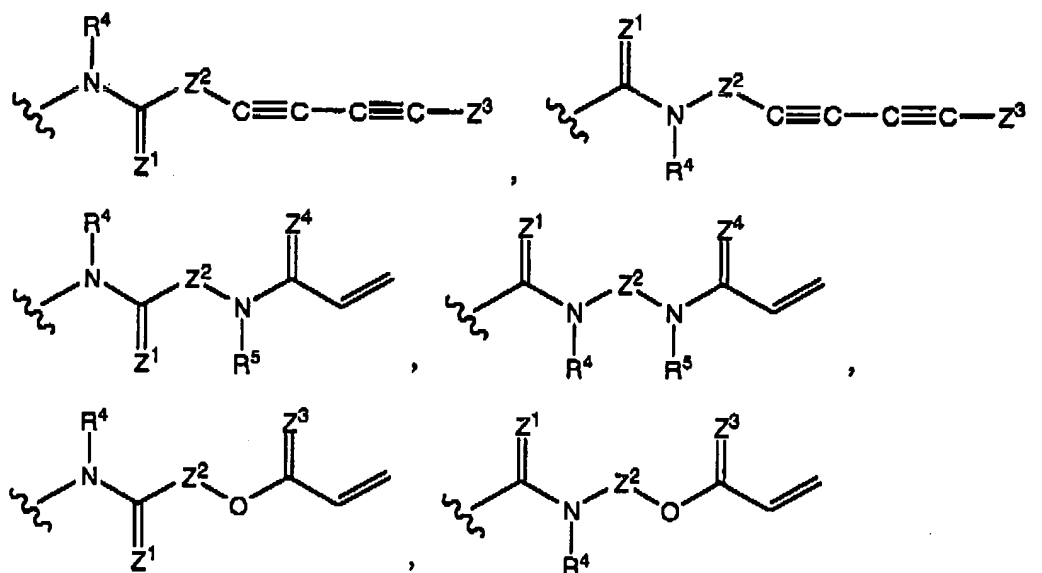
Y is single bond; optionally substituted alkylene in which at least one group selected from the group consisting -O-, -S-, -S-S-, -N(R^a)-C(=O)-, -C(=O)-N(R^b)-, and phenylene

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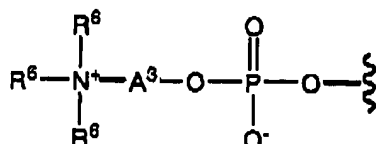
- which may be substituted, may intervene; or optionally substituted alkenylene in which at least one group selected from the group consisting -O-, -S-, -S-S-, -N(R^a)-C(=O)-, -C(=O)-N(R^b)-, and phenylene which may be substituted, may intervene (herein, R^a and R^b are independently a hydrogen atom or alkyl);

Z is a group represented by formulae:



- (herein, Z¹ is an oxygen atom or sulfur atom, Z² and Z³ are independently optionally substituted alkenylene in which phenylene may intervene, or optionally substituted alkenylene in which phenylene may intervene, Z⁴ is an oxygen atom or a sulfur atom, R⁴ and R⁵ are independently a hydrogen atom or alkyl)]; and

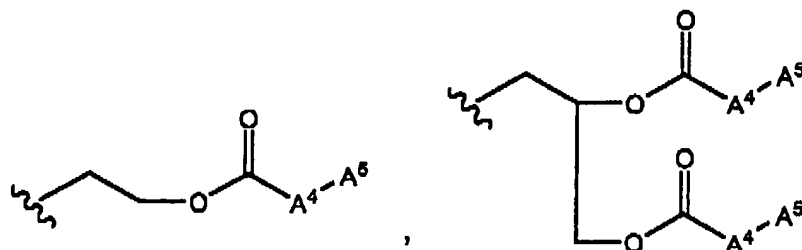
- a compound represented by formula (II): A¹-A²(II) [herein, A¹ is H(OCH₂CH₂)_nO- (n is an integer from 1 to 5) or a group represented by a formula:



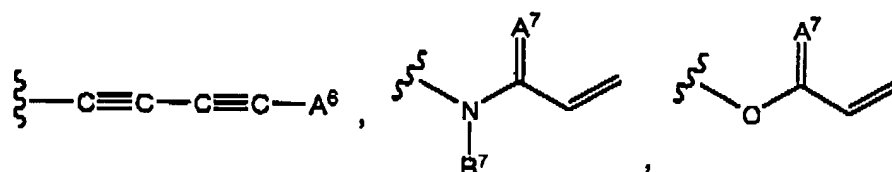
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(herein, A^3 is alkylene, and R^6 is alkyl); and A^2 is a group represented by formulae:



(herein, A^4 is alkylene, and A^5 is represented by formulae:



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(A^6 is alkylene, A^7 is an oxygen atom or a sulfur atom, and R^7 is a hydrogen atom or alkyl)).

13. A substance according to claim 12, wherein the polymerization is initiated by UV-irradiation.

14. A substance according to claim 12, wherein mole fraction of the compound represented by formula (II) is 0.1 to 0.9.

15. A substance according to claim 12, obtained by polymerizing monolayers obtained by physical adsorption of Z site of the compound represented by formula (I) and A^2 site of the compound represented by formula (II) to a support.

16. A substance according to claim 12, obtained by polymerizing water dispersion or a cast film of a mixture comprising the compound represented by formula (I) and the compound represented by formula (II).

17. A sugar chain-trapping carrier, comprising a substance

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which can specifically interact with sugar chains.

18. A sugar chain-trapping carrier, in which the substance according to claim 9 or 12 is transferred to a support.

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19. A method for synthesizing a substance which can specifically interact with sugar chains, comprising the steps of:

10 A) providing a functional group which can react with an aldehyde group in a fluid; and

B) binding the functional group to a desired substance.

15 20. A method for separating, concentrating, or purifying sugar chains or a sugar chain-containing substance in a sample, comprising the steps of:

20 a) contacting a sugar chain-trapping carrier comprising a substance which can specifically interact with sugar chains with the sample in a fluid phase under conditions that the sugar chain-trapping carrier can react with the sugar chains or sugar chain-containing substance;

b) isolating a composite of the sugar chain-trapping carrier and the sugar chains or sugar chain-containing substance from the fluid phase; and

25 c) exposing the composite to the conditions that the interaction between the sugar chain-trapping carrier and the sugar chains or sugar chain-containing substance is at least partially eliminated.

30 21. A method according to claim 20, further comprising the step of liberating an aldehyde group in the sample before step a).

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22. A method according to claim 21, wherein the step of liberating the aldehyde group comprises a treatment by glycosidase and/or a hydrazinolysis.

5 23. A method according to claim 20, further comprising the step of:

d) subjecting the sample to the conditions where the sugar chain-containing substance is separated into sugar chains and the remainder.

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24. An apparatus for separating, concentrating, or purifying sugar chains or a sugar chain-containing substance in a sample, comprising:

a) a sample introduction section;

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b) a container having a space which can house a fluid phase; and

c) a sugar chain-trapping carrier comprising a substance which can specifically interact with sugar chains, the container being in fluid communication with the sample introduction section.

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25. A system for separating, concentrating, or purifying sugar chains or a sugar chain-containing substance in a sample, comprising:

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A) an apparatus comprising:

a) a sample introduction section;

b) a container having a space which can house a fluid phase; and

c) a sugar chain-trapping carrier comprising a substance which can specifically interact with sugar chains, the container being in fluid communication with the sample introduction section;

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B) means for isolating a composite of the sugar

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chain-trapping carrier and the sugar chains in the fluid phase; and

5 C) means for exposing the composite to the conditions that the interaction between the sugar chain-trapping carrier and the sugar chains is at least partially eliminated.

10 26. A method for manufacturing an apparatus for separating, concentrating, or purifying sugar chains or a sugar chain-containing substance in a sample comprising the steps of:

a) providing a substance which can specifically interact with sugar chains;

15 b) causing the substance which can specifically interact with sugar chains to interact with the support to produce a sugar chain-trapping carrier; and

c) fixing the sugar chain-trapping carrier to a container.

20 27. A method for analyzing sugar chains or a sugar chain-containing substance in a sample, comprising the steps of:

25 a) contacting a sugar chain-trapping carrier comprising a substance which can specifically interact with sugar chains with the sample in a fluid phase under the conditions that the sugar chain-trapping carrier can react with the sugar chains;

b) exposing the sugar chain-trapping carrier and the sample to the conditions of desired stringency; and

30 c) identifying a substance interacted with the sugar chain-trapping carrier.

28. A method according to claim 27, wherein the identifying step c) includes a mass spectrometry analysis.

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29. A method for producing a sugar chain replica of a sample comprising or expected to comprise sugar chains, comprising the steps of:

5 a) locating a substance which can specifically interact with sugar chains on a surface of a two-dimensionally extended support, and contacting a surface on which the substance is not being located with a solid foil; and

10 b) contacting the sample comprising or expected to comprise sugar chains with the solid foil.

30. A sugar chain replica of a sample comprising or expected to comprise sugar chains, comprising:

15 a) solid foil;
 b) a two-dimensionally extended support on which a substance which can specifically interact with sugar chains is located, the support for interacting with the solid foil; and

20 c) a component derived from the sample comprising or expected to comprise sugar chains, the component being trapped by the substance which can specifically interact with sugar chains.

25 31. A method for analyzing sugar chains on a sample comprising or expected to comprise sugar chains, comprising the steps of:

30 a) locating a substance which can specifically interact with sugar chains on a surface of a two-dimensionally extended support, and contacting the surface on which the substance is not located with a solid foil;

 b) contacting the sample comprising or expected to comprise sugar chains with the solid foil; and

 c) analyzing sugar chains existing on a surface of

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the solid foil.

32. An apparatus for analyzing sugar chains or a sugar chain-containing substance in a sample, comprising:

5 a) sugar chain-trapping carrier comprising a substance which can specifically interact with sugar chains; and

 b) means for identifying the sugar chains.

10 33. A device for analyzing sugar chains or a sugar chain-containing substance in a sample, comprising a support on which a substance which can specifically interact with sugar chains is located.

15 34. A method for diagnosing or differentiating a subject, comprising the step of:

 a) analyzing sugar chains or a sugar chain-containing substance in a sample derived from the subject using the device according to claim 33.

20 35. A system for analyzing sugar chains or a sugar chain-containing substance in a sample, comprising:

 a) sugar chain-trapping carrier comprising a substance which can specifically interact with sugar chains;

25 b) means for exposing the sugar chain-trapping carrier and the sample to the conditions of desired stringency; and

 c) means for identifying the sugar chains.

30 36. A method for manufacturing an apparatus for analyzing sugar chains or a sugar chain-containing substance in a sample, comprising the steps of:

 a) providing a substance which can specifically

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interact with sugar chains; and

b) causing the substance which can specifically interact with sugar chains to interact with the support to produce a sugar chain-trapping carrier.

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37. A method for producing a sugar chain array, comprising the steps of:

a) providing a support;

10 b) locating a substance which can specifically interact with sugar chains in a desired arrangement.

38. A method for analyzing a substance specifically binding to sugar chains or a sugar chain-containing substance in a sample, comprising the steps of:

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a) causing a sugar chain-trapping carrier comprising a substance which can specifically interact with sugar chains to interact with the sugar chains or sugar chain-containing substance in a fluid phase to fix;

20 b) contacting the sugar chain-trapping carrier with the sample under the conditions expected that the substance specifically binding to sugar chains or a sugar chain-containing substance can react with the sugar chains;

25 c) exposing a mixture of the sugar chain-trapping carrier and the sample to the conditions of desired stringency; and

d) identifying the substance specifically binding to sugar chains or a sugar chain-containing substance.

30 39. A method according to claim 38, wherein the substance specifically binding to sugar chains or a sugar chain-containing substance is an antibody or lectin.

40. A device for analyzing a substance specifically binding

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to sugar chains or a sugar chain-containing substance in a sample, comprising:

- 5 a) a sugar chain-trapping carrier comprising a substance which can specifically interact with sugar chains, in which the sugar chains or sugar chain-containing substance is fixed to the carrier by specific interaction.

10 41. A system for analyzing a substance specifically binding to sugar chains or a sugar chain-containing substance in a sample, comprising:

- 15 a) a device comprising a sugar chain-trapping carrier comprising a substance which can specifically interact with sugar chains, in which the sugar chains or sugar chain-containing substance is fixed to the carrier by specific interaction;

b) a sample introduction section;

c) means for exposing a mixture of the sugar chain-trapping carrier and the sample to the conditions of desired stringency; and

- 20 d) means for identifying the substance specifically binding to sugar chains or a sugar chain-containing substance.

25 42. A sugar chain composition having an increased sugar chain content, obtained by contacting a sample comprising sugar chains with a substance which can specifically interact with sugar chains, and then separating sugar chains in the interacted sample.

30 43. A sugar chain composition according to claim 42, wherein the substance which can specifically interact with sugar chains can specifically interact with any sugar chain at a certain level or higher.